

Serial No. 9/838,340

IN THE CLAIMS:

The text of all pending claims, (including withdrawn claims) is set forth below. Cancelled and not entered claims are indicated with claim number and status only. The claims as listed below show added text with underlining and deleted text with ~~strike through~~. The status of each claim is indicated with one of (original), (currently amended), (cancelled), (withdrawn), (new), (previously presented), or (not entered).

Please AMEND claims 1-16, 18-33, and 36-43. Please WITHDRAW claims 34, and 36-43. Please CANCEL claim 17.

1. (Currently Amended) A method of compressing a grinding sludge containing an oil-based coolant to make a compressed solid material, which sludge is a grinding sludge resulting from a hardened steel material ~~used as a material for bearings, which the method comprises the steps of comprising:~~

filtering the grinding sludge to provide a concentrated sludge; and

compressing the concentrated sludge by squeezing to thereby provide the compressed solid material.

2. (Currently Amended) The method of compressing the grinding sludge as claimed in Claim claim 1, wherein the grinding sludge before being filtered is a fluid medium containing the coolant in a quantity equal to or greater than 90 wt%.

3. (Currently Amended) The method of compressing the grinding sludge as claimed in Claim claim 1, wherein the compressed solid material formed by the compressing step contains the coolant in a quantity within the range of 5 to 10 wt%.

4. (Currently Amended) The method of compressing the grinding sludge as claimed in Claim claim 1, wherein during the filtering step, the grinding sludge is guided towards a filtering belt and is filtered under pressure by utilization of a compressed air.

5. (Currently Amended) The method of compressing the grinding sludge as claimed in Claim claim 1, wherein where a plurality of kinds of the coolants are used in a grinding line, the filtering step and the compressing steps are performed for each kind of the coolants in a paralleling fashion.

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6. (Currently Amended) The method of compressing the grinding sludge as claimed in Claim claim 1, wherein the steel material used as a material for bearings is component parts of a rolling bearing.

7. (Currently Amended) An apparatus for making a compressed solid material by compressing a grinding sludge containing an oil-based coolant, which sludge is a grinding sludge resulting from a hardened steel material used as a material for bearings, which apparatus comprises:

a ~~filtering means for~~ filter filtering the grinding sludge to provide a concentrated sludge; and

a ~~compressing means for~~ compressor compressing the concentrated sludge by squeezing to thereby provide the compressed solid material.

8. (Currently Amended) An apparatus for making a compressed solid material by compressing a grinding sludge containing a coolant, which sludge is produced in a grinding line for grinding hardened component parts, by filtering the grinding sludge to provide a concentrated sludge which is subsequently compressed by squeezing to provide a compressed solid material, said apparatus comprising:

a primary press unit for accommodating a predetermined quantity of the concentrated sludge and pre-compressing the concentrated sludge that has been accommodated; and

a secondary press unit for compressing the pre-compressed sludge under a predetermined pressure to thereby provide the compressed solid material,

wherein said primary press unit is coupled to said secondary press unit through a passage through which said pre-compressed sludge passes.

9. (Currently Amended) ~~The An apparatus as claimed in Claim 8, making a compressed solid material by compressing a grinding sludge containing a coolant, which sludge is produced in a grinding line grinding hardened component parts, by filtering the grinding sludge to provide a concentrated sludge which is subsequently compressed by squeezing to provide a compressed solid material, said apparatus comprising:~~

a primary press unit accommodating a predetermined quantity of the concentrated sludge and pre-compressing the concentrated sludge that has been accommodated; and

a secondary press unit compressing the pre-compressed sludge under a predetermined pressure to thereby provide the compressed solid material.

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wherein the primary press unit is a vertical press having a primary compressing chamber in which the concentrated sludge is pre-compressed in a downward direction and includes a shutter defined at a lower end thereof for discharge of the pre-compressed sludge and wherein the secondary press unit is a transverse press including a secondary compressing chamber having a portion positioned immediately below the shutter for receiving the pre-compressed sludge by way of the shutter.

10. (Currently Amended) ~~The An apparatus as claimed in Claim 8, making a~~
compressed solid material by compressing a grinding sludge containing a coolant, which sludge
is produced in a grinding line grinding hardened component parts, by filtering the grinding sludge
to provide a concentrated sludge which is subsequently compressed by squeezing to provide a
compressed solid material, said apparatus comprising:

a primary press unit accommodating a predetermined quantity of the concentrated
sludge and pre-compressing the concentrated sludge that has been accommodated;

a secondary press unit compressing the pre-compressed sludge under a predetermined
pressure to thereby provide the compressed solid material; and

further comprising a sludge supply unit positioned above the primary press unit for
supplying the concentrated sludge into the primary compressing chamber, said sludge supply
unit being a vertical type sludge supply unit including a hopper through which the concentrated
sludge is allowed to fall by gravity into the primary compressing chamber through a sludge
receiving port of the primary press unit positioned below the hopper.

11. (Currently Amended) The apparatus as claimed in ~~Claim~~ claim 8, further
comprising a ~~heating means for heater~~ heating and maintaining the primary press unit to, and at,
a predetermined temperature range.

12. (Currently Amended) The apparatus as claimed in ~~Claim~~ claim 8, further
comprising a press ~~controller control means for~~ controlling a pressing work used for squeezing in
the secondary press unit to a predetermined pressure and a predetermined compressing speed.

13. (Currently Amended) ~~The An apparatus as claimed in Claim 8, making a~~
compressed solid material by compressing a grinding sludge containing a coolant, which sludge
is produced in a grinding line grinding hardened component parts, by filtering the grinding sludge
to provide a concentrated sludge which is subsequently compressed by squeezing to provide a
compressed solid material, said apparatus comprising:

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a primary press unit accommodating a predetermined quantity of the concentrated sludge and pre-compressing the concentrated sludge that has been accommodated; and
a secondary press unit compressing the pre-compressed sludge under a predetermined pressure to thereby provide the compressed solid material,

wherein the secondary press unit has a discharge port defined therein for to discharge of the compressed solid material, and further comprising a transport path following the discharge port, said transport path being divided into two paths, and a ~~sorting means for~~ sorter selectively switching the compressed solid material, discharged ~~from~~ from the discharge port, onto one of the two paths.

14. (Currently Amended) The apparatus as claimed in ~~Claim~~ claim 13, further comprising a pressure sensor provided in the secondary press unit and a sorting ~~control means~~ for controller controlling a switching operation of the ~~sorting means~~ sorter by comparing a pressure detected by the pressure sensor with a threshold value.

15. (Currently Amended) The apparatus as claimed in ~~Claim~~ claim 8, wherein the coolant contained in the grinding sludge is an oil-based coolant.

16. (Currently Amended) The apparatus as claimed in ~~Claim~~ claim 8, wherein the hardened component parts are those of a rolling bearing.

17. (Cancelled)

18. (Currently Amended) The apparatus as claimed in ~~Claim 17~~ claim 11, wherein the ~~heating means~~ heater comprises a heater disposed in the primary press unit.

19. (Currently Amended) The apparatus as claimed in ~~Claim 17~~ claim 11, wherein the ~~heating means~~ heater comprises a hot air blower ~~for~~ blowing a hot air to the primary press unit.

20. (Currently Amended) The apparatus as claimed in ~~Claim 17~~ claim 11, wherein the predetermined temperature range to, and at which, the concentrated sludge within the primary press unit is heated and maintained, is from 20 to 60 °C.

21. (Currently Amended) The apparatus as claimed in ~~Claim 17~~ claim 8, wherein the coolant is oil-based and of a paraffin type.

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22. (Currently Amended) The apparatus as claimed in ~~Claim 17~~ claim 8, wherein the primary press unit is a vertical press having a primary compressing chamber within which the sludge is downwardly compressed.

23. (Currently Amended) The apparatus as claimed in ~~Claim 17~~ claim 8, wherein the hardened component parts are ferrous component parts of a rolling bearing.

24. (Currently Amended) An apparatus making a compressed solid material by ~~for~~ compressing a grinding sludge containing a coolant, which sludge is produced in a grinding line ~~for~~ grinding hardened component parts, by filtering the grinding sludge to provide a concentrated sludge, which is subsequently compressed by squeezing, to provide a compressed solid material, said apparatus comprising:

a first press unit coupled to a second press unit through a passage, where at least one of said first and second press unit units having has a compressing chamber defined therein for compressing the concentrated sludge within the compressing chamber, to thereby provide the compressed solid material; and

a press control means for controller controlling

a pressure in said at least one first and second press units used for squeezing to squeeze to a predetermined pressure, and

a predetermined compressing speed.

25. (Currently Amended) The apparatus as claimed in ~~Claim~~ claim 24, wherein the ~~press control means~~ controller is operable to retain the pressure for a predetermined time when the pressure applied attains a target pressure.

26. (Currently Amended) ~~The An~~ An apparatus ~~as claimed in Claim 25, making a~~ compressed solid material by compressing a grinding sludge containing a coolant, which sludge is produced in a grinding line grinding hardened component parts, by filtering the grinding sludge to provide a concentrated sludge, which is subsequently compressed by squeezing, to provide a compressed solid material, said apparatus comprising:

a press unit having a compressing chamber defined therein compressing the concentrated sludge within the compressing chamber, to thereby provide the compressed solid material; and

a press controller controlling

a pressure used to squeeze to a predetermined pressure, and

a predetermined compressing speed.

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wherein the press controller is operable to retain the pressure for a predetermined time when the pressure applied attains a target pressure, and

wherein the predetermined time during which the pressure is retained is equal to or greater than 10 seconds.

27. (Currently Amended) The apparatus as claimed in ~~Claim 24~~ claim 25, wherein the press ~~control means~~ controller repeatedly performs an operation to retain the predetermined pressure for the predetermined length of time a number of times during a period in which the pressure used ~~during squeezing to squeeze~~ is progressively increased.

28. (Currently Amended) The apparatus as claimed in ~~Claim~~ claim 27, wherein the predetermined time over which the pressure is retained during the period in which the pressure is progressively increased is within the range of 2 to 3 seconds.

29. (Currently Amended) ~~The An~~ apparatus as claimed in ~~Claim 24~~, making a compressed solid material by compressing a grinding sludge containing a coolant, which sludge is produced in a grinding line grinding hardened component parts, by filtering the grinding sludge to provide a concentrated sludge, which is subsequently compressed by squeezing, to provide a compressed solid material, said apparatus comprising:

a press unit having a compressing chamber defined therein compressing the concentrated sludge within the compressing chamber, to thereby provide the compressed solid material; and

a press controller controlling

a pressure used to squeeze to a predetermined pressure, and

a predetermined compressing speed,

wherein the press ~~control means~~ controller is operable to slowly reduce the compressing speed.

30. (Currently Amended) ~~The An~~ apparatus as claimed in ~~Claim 24~~, making a compressed solid material by compressing a grinding sludge containing a coolant, which sludge is produced in a grinding line grinding hardened component parts, by filtering the grinding sludge to provide a concentrated sludge, which is subsequently compressed by squeezing, to provide a compressed solid material, said apparatus comprising:

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a press unit having a compressing chamber defined therein compressing the concentrated sludge within the compressing chamber, to thereby provide the compressed solid material; and

a press controller controlling

a pressure used to squeeze to a predetermined pressure, and

a predetermined compressing speed,

wherein the press ~~control means~~ controller applies the pressure for squeezing which is to squeeze equal to or lower than 400 MPa.

31. (Currently Amended) ~~The An apparatus as claimed in Claim 24, making a~~
compressed solid material by compressing a grinding sludge containing a coolant, which sludge is produced in a grinding line grinding hardened component parts, by filtering the grinding sludge to provide a concentrated sludge, which is subsequently compressed by squeezing, to provide a compressed solid material, said apparatus comprising:

a press unit having a compressing chamber defined therein compressing the concentrated sludge within the compressing chamber, to thereby provide the compressed solid material; and

a press controller controlling

a pressure used to squeeze to a predetermined pressure, and

a predetermined compressing speed,

wherein the press unit drives a pressing member ~~by means of using~~ a ball screw mechanism driven by an electric motor.

32. (Currently Amended) ~~The An apparatus as claimed in Claim 24, making a~~
compressed solid material by compressing a grinding sludge containing a coolant, which sludge is produced in a grinding line grinding hardened component parts, by filtering the grinding sludge to provide a concentrated sludge, which is subsequently compressed by squeezing, to provide a compressed solid material, said apparatus comprising:

a press unit having a compressing chamber defined therein compressing the concentrated sludge within the compressing chamber, to thereby provide the compressed solid material; and

a press controller controlling

a pressure used to squeeze to a predetermined pressure, and

a predetermined compressing speed,

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wherein the hardened component parts are ferrous component parts of a rolling bearing.

33. (Currently Amended) The apparatus as claimed in ~~Claim~~ claim 24, wherein the coolant is an oil-based coolant.

34. (Withdrawn) A compressed solid material prepared by compressing a grinding sludge containing a coolant, which sludge is produced in a grinding line for grinding hardened component parts, by squeezing, said compressed solid material being of a hollow cylindrical shape having a hollow defined therein.

35. (Cancelled)

37 36. (Currently Amended and Withdrawn) The compressed solid material as claimed in ~~Claim~~ claim 34, wherein the coolant in the compressed solid material is an oil-based coolant, the amount of said oil-based coolant being within the range of 5 to 10 wt%.

38 37. (Currently Amended and Withdrawn) The compressed solid material as claimed in ~~Claim~~ claim 34, wherein the hardened component parts are ferrous component parts of a rolling bearing.

39 38. (Currently Amended and Withdrawn) A grinding sludge recycling method for recycling a compressed solid material of the grinding sludge as a material for steel production, said recycling system comprising filtering the grinding sludge, produced in a grinding line for grinding hardened component parts, to provide a concentrated sludge which is subsequently compressed by squeezing to thereby provide the compressed solid material while a coolant separated from the grinding sludge during filtering and compressing processes is returned to the grinding line.

40 39. (Currently Amended and Withdrawn) The grinding sludge recycling method as claimed in ~~Claim-39~~ claim 38, wherein the hardened component parts are steel material used for bearings.

44 40. (Currently Amended and Withdrawn) The grinding sludge recycling method as claimed in ~~Claim-40~~ claim 39, wherein where a plurality of kinds of coolants are used in the grinding line, a plurality of processing lines are distributed depending on the kinds of the coolants used, each of said processing lines including means for performing the filtration, means

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for compressing by squeezing, a transport path for transporting the grinding sludge from the grinding line to the filtering means, and coolant recovery passages for returning the associated coolant from the filtering means and the compressing means back to the grinding line.

42 41. (Currently Amended and Withdrawn) The grinding sludge recycling system for recycling a grinding sludge produced in a grinding line for grinding hardened component parts, said recycling system comprising:

a transport means for transporting the grinding sludge;

a filtering means for filtering the grinding sludge so transported to thereby provide a concentrated sludge;

a compressing means for compressing by squeezing the concentrated sludge to thereby provide a compressed solid material; and

coolant recovery passages for returning a coolant separated from the grinding sludge during filtering and compressing processes back to the grinding line.

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